SBIR

Small Business Innovation Research

FY 2009

NOAA Program Solicitation

Opening Date: October 15, 2008
Closing Date: January 14, 2009

October 2008 **NOAA 2009-1**

U.S. DEPARTMENT OF COMMERCE
http://www.oar.noaa.gov/ORTA

TABLE OF CONTENTS

DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

PROGRAM SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH

1.0 PROGRAM DESCRIPTION

1.1 Introduction

The Department of Commerce (DOC) National Oceanic and Atmospheric Administration (NOAA), invites small businesses to submit research proposals under this solicitation. Firms with strong research capabilities in any of the areas listed in Section 8 of this solicitation are encouraged to participate. **Unsolicited proposals are not accepted under the Small Business Innovation Research (SBIR) program.**

Objectives of this program include stimulating technological innovation in the private sector and strengthening the role of small business in meeting Federal research and development (R&D) needs. This program also seeks to increase the commercial application of innovations derived from Federal research and to foster and encourage participation by socially and economically disadvantaged and woman-owned small businesses. Also, in accordance with E.O. 13329, the NOAA SBIR program will give a high priority, where feasible, to proposals that are directed toward innovations that will aid the manufacturing sector of the Nation's economy.

1.2 Three-Phase Program

The "Small Business Innovation Research Program Reauthorization Act of 2000" requires the Department of Commerce to establish a three-phase SBIR program by reserving a percentage of its extramural R&D budget to be awarded to small business concerns for innovation research.

The funding vehicles for NOAA's SBIR program in both Phase I and Phase II are contracts. This document solicits Phase I proposals only.

NOAA has the unilateral right to select SBIR research topics and awardees in both Phase I and Phase II, and to award several or no contracts under a given subtopic.

1.2.1 Phase I – Feasibility Research

The purpose of Phase I is to determine the technical feasibility of the proposed research and the quality of performance of the small business concern receiving an award. Therefore, the proposal should concentrate on research that will significantly contribute to proving the feasibility of the proposed research, a prerequisite to further support in Phase II.

1.2.2 Phase II – Research and Development

Only firms that are awarded Phase I contracts under this solicitation will be given the opportunity to submit a Phase II proposal immediately following completion of Phase I. Phase II is the R&D or prototype development phase. It will require a comprehensive proposal outlining the research in detail and a plan to commercialize the final product. NOAA may require delivery of the prototype. Each Phase II applicant will be required to provide information for the SBA Tech-Net Database System (http://tech-net.sba.gov) when advised this system can accept their input.

Further information regarding Phase II proposals and Tech-Net requirements will be provided to all firms receiving Phase I contracts.

1.2.3 Phase III – Commercialization

In Phase III, it is intended that non-SBIR capital be used by the small business to pursue commercial applications of Phase II.

1.3 Eligibility

Each organization submitting a proposal **must** qualify as a small business (Section 2.1) for research or R&D purposes (Section 2.2) at the time of the award. In addition, the primary employment of the principal investigator must be with the small business at the time of the award and during the conduct of the research. More than one-half of the principal investigator's time must be spent with the small business for the period covered by the award. **Primary employment with a small business precludes full-time employment with another organization. The NOAA program manager in consultation with the contracting officer must approve deviation from these requirements.**

Also, for both Phase I and Phase II, the work must be performed in the United States. "United States" means the fifty states, the territories and possessions of the United States, the Commonwealth of Puerto Rico, the District of Columbia, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau. **The NOAA program Manager in consultation with the contracting officer may approve exceptions to this requirement.**

Joint ventures and limited partnerships are eligible, provided the entity created qualifies as a small business as defined in this solicitation. **Consultative arrangements between firms and universities or other non-profit organizations are encouraged, with the small business serving as the prime contractor.**

1.4 Contact with NOAA

In the interest of competitive fairness, oral or written communication with NOAA or any of its components concerning additional information on the technical topics described in Section 8 of this solicitation **is prohibited**.

Requests for general information on the NOAA SBIR program may be addressed to:

Dr. Joseph M. Bishop, NOAA SBIR Program Manager
1335 East West Highway, SSMC1, Suite 106
Silver Spring MD 20910 – 3284
Telephone: 301-713-3565, Fax: 301-713-4100
E-mail: joseph.bishop@noaa.gov

Additional scientific and technical information sources are listed in Section 7.

2.0 DEFINITIONS

2.1 Small Business Concern

A Small Business Concern is one that, at the time of award for Phase I and Phase II is:

(a) Organized for profit, with a place of business located in the United States, which operates primarily within the United States or which makes a significant contribution to the United States economy through payment of taxes or use of American products, materials or labor;

(b) In the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative, except that where the form is a joint venture, there can be no more than 49 percent participation by business entities in the joint venture;

(c) At least 51 percent owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States, or it must be a for-profit business concern that is at least 51% owned and controlled by another for-profit business concern that is at least 51% owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States (except in the case of a joint venture);

(d) Including its affiliates, 500 or fewer employees.

2.2 Research or Research and Development

Any activity that is (a) a systematic, intensive study directed toward greater knowledge or understanding of the subject studied; (b) a systematic study directed specifically toward applying new knowledge to meet a recognized need; or (c) a systematic application of knowledge toward the production of useful materials, devices, systems, or

methods, and includes design, development, and improvement of prototypes and new processes to meet specific requirements.

In general, the NOAA SBIR program will fund Phase I and Phase II proposals with objectives that can be defined by (b) and (c) above.

2.3 Socially and Economically Disadvantaged Small Business Concern

Is one that is:

(a) at least 51 percent owned by (1) an American Indian tribe or a native Hawaiian organization, or (2) one or more socially and economically disadvantaged individuals, and

(b) controlled by one or more such individuals in its management and daily business operations.

A socially and economically disadvantaged individual is defined as a member of any of the following groups: Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Subcontinent Asian Americans, or any other individual found to be socially and economically disadvantaged by the Small Business Administration (SBA) pursuant to Section 8(a) of the Small Business Act, 15 U.S. Code (U.S.C.) 637(a).

2.4 Women-Owned Small Business

A small business that is at least 51 percent owned by a woman or women who also control (meaning to exercise the power to make policy decisions) and operate (meaning being actively involved in the day-to-day management) the small business.

2.5 Funding Agreement

Any contract, grant, or cooperative agreement entered into between any Federal agency and any small business concern for the performance of experimental, developmental, or research work, including products or services, funded in whole or in part by the Federal Government.

For purposes of this Solicitation, NOAA intends to award firm-fixed-price purchase orders and/or contracts under the authority of Federal Acquisition Regulations for Phase I and Phase II of the SBIR program.

2.6 Subcontract

This is any agreement, other than one involving an employer-employee relationship, entered into under a Federal Government funding agreement, calling for supplies or services required solely for the performance of the original funding agreement (firm-fixed-priced contract).

2.7 Commercialization

This is locating or developing markets and producing and delivering products or services for sale (whether by the originating party or by others). As used here, commercialization includes both Government and private sector markets.

2.8 Essentially Equivalent Work

This occurs when (1) substantially the same research is proposed for funding in more than one contract proposal or grant application submitted to the same Federal agency; (2) substantially the same research is submitted to two or more different Federal agencies for review and funding consideration; or (3) a specific research objective and the research design for accomplishing an objective are the same or closely related in two or more proposals or awards, regardless of the funding source.

3.0 PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

3.1 Proposal Requirements

The objective is to provide sufficient information to demonstrate that the proposed work represents a sound approach to the investigation of an important scientific or engineering innovation. **The proposal must meet all the requirements of the subtopic in Section 8 to which it applies.** A proposal must be self-contained and written with all the care and thoroughness of a scientific paper submitted for publication. It should indicate a thorough knowledge of the current status of research in the subtopic area addressed by the proposal. **A proposal will not be deemed acceptable if it represents presently available technology.** Each proposal should be checked carefully by the offeror to ensure inclusion of all essential material needed for a complete evaluation. The proposal will be peer reviewed as a scientific paper. All units of measurement should be in the metric system.

NOAA reserves the right not to submit to technical review any proposal which has insufficient scientific and technical information, or one which fails to comply with the administrative procedures as outlined in the NOAA/SBIR Checklist in Section 10.

The proposal must not only be responsive to the specific NOAA program interests described in Section 8 of the solicitation, but also serve as the basis for technological innovation leading to **new commercial products, processes, or services.** An organization may submit different proposals on different subtopics or different proposals on the same subtopic under this solicitation. When the proposed innovation applies to more than one subtopic, the offeror must choose that subtopic which is most relevant to the offeror's technical concept.

Proposals principally for the commercialization of proven concepts or for market research must not be submitted for Phase I funding, since such efforts are considered the responsibility of the private sector.

The proposal should be direct, concise, and informative. Promotional and other material not related to the project shall be omitted. **The Phase I proposal must provide a description of potential commercial applications.**

3.2 Phase I Proposal Limitations

- Page Length - **no more than 25 pages**, consecutively numbered, including the cover page, project summary, main text, references, resumes, any other enclosures or attachments, and the proposal summary budget.

- Paper Size - must be 21.6 cm X 27.9 cm (8 ½" X 11").

- Print Size - **must be easy to read with a fixed pitch font of 12 or fewer characters per inch or proportionally spaced font of point size 10 or larger with no more than six lines per inch. Margins should be at least 2.5cm.**

Supplementary material, revisions, substitutions, audio or videotapes, or computer floppy disks will **not** be accepted.

Proposals not meeting these requirements will be returned without review.

3.3 Phase I Proposal Format

3.3.1 Cover Sheet

Complete Section 9.1 "Cover Page" as page 1 of each copy of each proposal. **NO OTHER COVER WILL BE ACCEPTED.** Xerox copies are permitted.

3.3.2 Project Summary

Complete Section 9.2 "Project Summary" as page 2 of your proposal. The technical abstract should include a brief description of the problem or opportunity, the innovation, project objective, and technical approach.

In summarizing anticipated results, include technical implications of the approach (for both Phase I and II) and the potential commercial applications of the research. **The Project Summary of the proposals that receive an award will be published by NOAA and, therefore, must not contain proprietary information.**

3.3.3 Technical Content

Beginning on page 3 of the proposal, include the following items with headings as shown:

(a) **Identification and Significance of the Problem or Opportunity.** Make a clear statement of the specific research problem or opportunity addressed, its innovativeness, commercial potential, and why it is important. Show how it applies to a specific subtopic in Section 8.

(b) **Phase I Technical Objectives.** State the specific objectives of the Phase I effort, including the technical questions it will try to answer to determine the feasibility of the proposed approach.

(c) **Phase I Work Plan.** Include a detailed description of the Phase I R&D plan. The plan should indicate not only what will be done, but also where it will be done, and how the R&D will be carried out. The methods planned to achieve each objective or task should be discussed in detail. **This section should be at least one-third of the proposal.**

(d) **Related Research or R&D.** Describe research or R&D that is directly related to the proposal, including any conducted by the principal investigator or by the proposer's firm. Describe how it relates to the proposed effort, and describe any planned coordination with outside sources. **The purpose of this section is to persuade reviewers of the proposer's awareness of recent development in the specific topic area and assure them that the proposed research represents technology presently not available in the marketplace.**

(e) **Key Personnel and Bibliography of Related Work.** Identify key personnel involved in Phase I, including their related education, experience, and publications. Where resumes are extensive, summaries that focus on the most relevant experience and publications are suggested. List all other commitments that key personnel have during the proposed period of contract performance.

(f) **Relationship with Future R&D.** Discuss the significance of the Phase I effort in providing a foundation for the Phase II R&D effort. Also state the anticipated results of the proposed approach, if Phases I and II of the project are successful.

(g) **Facilities and Equipment.** The conduct of advanced research may require the use of sophisticated instrumentation or computer facilities. The proposer should provide a detailed description of the availability and location of the facilities and equipment necessary to carry out Phase I.

(h) **Consultants and Subcontracts.** The purpose of this section is to convince NOAA that: (1) research assistance from outside the firm materially benefits the proposed effort, and (2) arrangements for such assistance are in place at the time the proposal is submitted.

Outside involvement in the project is encouraged where it strengthens the conduct of the research; such involvement is not a requirement of this solicitation.

1. Consultant – A person outside the firm, named in the proposal as contributing to the research, must provide a signed statement confirming his/her availability, role in the project, and agreed consulting rate for participation in the project. **This statement is part of the page count.**

2. Subcontract – Similarly, where a subcontract is involved in the research, the subcontracting institution must furnish a letter signed by an appropriate official describing the programmatic arrangements and confirming its agreed participation in the research, with its proposed budget for this participation. **This letter is part of the page count.**

(i) **Potential Commercial Applications and Follow-on Funding Commitment.** Describe in detail the commercial potential of the proposed research, how commercialization would be pursued, benefits over present products on the market, and potential use by the Federal Government.

(j) **Cooperative Research and Development Agreements (CRADA).** State if the applicant is a current CRADA partner with NOAA, or with any other Federal agency, naming the agency title of the CRADA, and any relationship with the proposed work.

(k) **Guest Researcher.** State if the applicant is a guest researcher at NOAA, naming the sponsoring laboratory.

(l) **Cost Sharing.** Cost participation could serve the mutual interest of NOAA and certain SBIR contractors by helping to assure the efficient use of available resources. Except where required by other statutes, NOAA does not encourage or require cost sharing on Phase I projects, nor will cost sharing be a consideration in evaluation of Phase I proposals.

3.4 Equivalent Proposals or Awards

NOTE: While it is permissible, with proposal notification, to submit identical proposals or proposals containing a significant amount of essentially equivalent work for consideration under numerous Federal program solicitations, it is unlawful to enter into funding agreements requiring essentially equivalent work. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.

A firm may have received other SBIR awards or elected to submit essentially equivalent proposals under other SBIR program solicitations. In these cases, a statement **must** follow the Technical Content section in the proposal indicating:

(a) the name and address of all agencies to which a proposal was submitted or from which an SBIR award was received;

(b) the date of proposal submission or date of award;

(c) the title, number, and date of the SBIR program solicitation under which a proposal was submitted or award received;

(d) the specific applicable research topic for each proposal submitted or award received;

(e) the title of the research project; and

(f) the name and title of the principal investigator for each proposal submitted or award received.

If no equivalent proposal is under consideration or equivalent award received, a statement to that effect **must** be included in this section of the technical content area of the proposal and certified within the Cover Sheet.

3.5 Prior SBIR Phase II Awards

If a small business concern has received one or more Phase II awards from any of the Federal agencies in the prior five fiscal years, it must submit on a separate page, the names of awarding agencies, dates of awards, funding agreement numbers, amounts, topic or subtopic titles, follow-on agreement amounts, sources and dates of commitments, and current commercialization status for each Phase II. **This required information shall not be part of the page count limitation.**

3.6 Proposed Budget

Complete the "NOAA/SBIR Proposal Summary Budget" (Section 9.3) for the Phase I effort, and include it as the last page of the proposal. Some items on this form may not apply. Enough information should be provided to allow NOAA to understand how the offeror plans to perform if the contract is awarded. A complete cost breakdown should be provided giving labor rates, proposed number of hours, overhead, G&A, and profit. A reasonable profit will be allowed. When proposing travel, identify the number of trips, people involved, labor categories, destination of travel, duration of trip, commercial airfare or mileage rate, per diem expenses, and purpose of travel. Budgets for travel funds must be justified and related to the needs of the project. Where equipment is to be purchased, list each individual item with the corresponding cost. The inclusion of equipment will be carefully reviewed relative to need and appropriateness for the research proposed. Equipment is defined as an article of nonexpendable, tangible

property having a useful life of more than one year and an acquisition cost of $5,000 or more per unit.

SBA Policy requires that NOAA not issue SBIR awards that include provisions for subcontracting any portion of the contract back to the originating agency or any other Federal Government agency or to other units of the Federal Government. Requests for waivers from this requirement must be sent to the NOAA program manager.

For Phase I, the proposing firm must perform a minimum of two-thirds of the research and/or analytical effort. The total cost for all consultant fees, facility leases, usage fees, and other subcontract or purchase agreements may not exceed one-third of the total contract price. For Phase II, the proposing firm must perform one-half of the research and/or analytical effort.

4.0 METHOD OF SELECTION AND EVALUATION CRITERIA

4.1 Introduction

All Phase I and II proposals will be evaluated on a competitive basis. Each Phase I proposal will be screened by NOAA to ensure that it meets the administrative requirements outlined in Section 4.2. Proposals that meet these requirements will be peer reviewed, undergo competitive review within each laboratory, and may also undergo a third round of competitive review across the agency.

4.2 Phase I Evaluation Criteria

To avoid a misunderstanding, small businesses are cautioned that Phase I proposals not satisfying all the evaluation criteria shall be returned without peer review and eliminated from consideration for a contract. Proposals may not be resubmitted (with or without revisions) under this solicitation. All copies of proposals that fail the screening process will be returned. The evaluation criteria are:

(a) The proposing firm must qualify as a small business (Section 2.1). If it is a subsidiary of another firm, this limit applies to all employees under control of the parent organization.

(b) The Phase I proposal must meet **all** of the requirements stated in Section 3.

(c) The Phase I proposal must be limited to one subtopic and clearly address research for that subtopic.

(d) **Phase I proposal budgets must not exceed $95,000.**

(e) **The project duration for the Phase I research must not exceed six months.**

(f) The proposing firm must carry out a minimum of two-thirds of expenditures under each Phase I project.

(g) The proposal must contain information sufficient to be peer reviewed.

4.3 Phase I Evaluation and Selection Criteria

Phase I proposals will be rated by NOAA and/or external scientists or engineers with equal consideration given to the following criteria, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit of the Phase I research plan and its relevance to the objectives, with special emphasis on its innovativeness and originality.

(b) Importance of the problem or opportunity and anticipated benefits of the proposed research to NOAA, and the commercial potential, if successful.

(c) How well the research objectives, if achieved, establish the feasibility of the proposed concept and justify a Phase II effort.

(d) Qualifications of the principal investigator(s), other key staff, and consultants, and the probable adequacy of available or obtainable instrumentation and facilities.

Reviewers will base their ratings on information contained in the proposal. It cannot be assumed that reviewers are acquainted with any experiments referred to, key individuals and facilities.

Final award decisions will be made by NOAA based upon ratings assigned by reviewers and consideration of additional factors, **including possible duplication of other research**, the importance of the proposed research as it relates to NOAA needs, and the availability of funding. NOAA may elect to fund several or none of the proposals received on a given subtopic. Approximately one-third of subtopic areas are generally funded in this solicitation. Upon selection of a proposal for a Phase I award, NOAA reserves the right to negotiate the amount of the award.

4.4 Phase II Evaluation and Selection Criteria

The Phase II proposal will undergo NOAA and external peer review for the purpose of determining overall technical or scientific merit. Review panels, composed of senior technical specialists, will make the final Phase II selection decision based on the written reviews and the company presentation to the panel. Each of the following evaluation

criteria will receive approximately equal weight, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit with emphasis on innovation and originality.

(b) Degree to which the Phase I objectives were met.

(c) The commercial potential of the proposal as evidenced by: 1) a record of commercialization, 2) the existence of Phase II funding commitments from non-SBIR sources, 3) existence of Phase III follow-on commitments, and 4) the presence of other indications of commercial potential of the research.

(d) The adequacy of the Phase II objectives to meet the problem or opportunity.

(e) The qualifications of the principal investigator and other key personnel to carry out the proposed work.

Upon selection of a proposal for Phase II award, NOAA reserves the right to negotiate the amount of the award. NOAA is not obligated to fund any specific Phase II proposal.

4.5 Release of Proposal Review Information

After final award decisions have been announced, the technical evaluations of a proposal will be provided to the proposer only upon written request and for a period not to exceed 90 days. The identity of the reviewers will not be disclosed.

5.0 CONSIDERATIONS

5.1 Awards

Contingent upon availability of funds, NOAA anticipates awarding approximately **10** Phase I firm-fixed price contracts of no more than **$95,000** each. The performance period, with no exception, shall be no more than six months. Historically, NOAA has funded approximately ten percent of the Phase I proposals submitted which is approximately one-third of the subtopic areas.

Phase II awards shall be for no more than $400,000 (except for subtopics with the suffix "SG", which are limited to $300,000). The period of performance in Phase II will depend upon the scope of the research, but should not normally exceed 24 months.

It is anticipated that **approximately one-third of the Phase I awardees will receive Phase II awards**, contingent upon the availability of funds. To provide for an in-depth review of the Phase I final report and the Phase II proposal and commercialization plan, Phase II awards will be made approximately seven months after the completion of Phase I.

For planning purposes, proposers should understand that Phase I awards are made in July, Phase II proposals are due the following February, and Phase II awards are made during August and September.

This solicitation does not obligate NOAA to make any awards under either Phase I or Phase II. Furthermore, NOAA is not responsible for any monies expended by the proposer before award of any contract resulting from this solicitation.

5.2 Reports

Six copies of a final report on the Phase I project shall be submitted to NOAA upon completion of the Phase I research. The final report shall include a single-page project summary as the first page, identifying the purpose of the research, and giving a brief description of the research carried out, the research findings or results, and the commercial applications of the research in a final paragraph. The remainder of the report should indicate in detail the research objectives, research work carried out, results obtained, and estimates of technical feasibility.

All final reports must carry an acknowledgement on the cover page such as: "This material is based upon work supported by the Department of Commerce under contract number _____. Any opinions, findings, conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the Department of Commerce."

Progress reports in a brief letter format will be required also.

5.3 Payment Schedule

The specific payment schedule (including payment amounts) for each contract will be incorporated into the contract upon completion of negotiations between the Government and the successful Phase I or Phase II contractor.

5.4 Proprietary Information, Inventions, and Patents

5.4.1 Limited Rights in Information and Data

Information contained in unsuccessful proposals will remain the property of the proposer, except that the "Project Summary" page may be made available to a limited audience through the SBA Tech-Net System. The Government may, however, retain copies of all proposals. Any proposal, which is funded, will not be made available to the public, except for the "Project Summary" page.

The inclusion of proprietary information is discouraged unless it is absolutely necessary for the proper evaluation of the proposal.

Proprietary information submitted to NOAA will be treated in confidence, to the extent permitted by law, if it is confined to a separate page with a numbering system key, and marked with a legend reading: "Following is proprietary information which (name of proposing firm) requests not be released to persons outside the Government, except for purposes of evaluation."

Any other legend will be unacceptable to NOAA and may constitute grounds for return of the proposal without further consideration. Without assuming any liability for

inadvertent disclosure, NOAA will limit dissemination of such information to its employees and, where necessary for evaluation, to outside reviewers on a confidential basis.

Since technical reports may eventually be made available to the public, such reports shall not contain any language limiting their use other than for SBIR data as described below.

5.4.2 Copyrights

The contractor may normally establish claim to copyright any written material first produced in the performance of an SBIR contract. If a claim to copyright is made, the contractor shall affix the applicable copyright notice of 17 U.S.C. 401 or 402 an acknowledgment of Government sponsorship (including contract number) to the material when delivered to the Government, as well as when the written material or data are published or deposited for registration as a published work in the U.S. Copyright Office. For other than computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government.

For computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license for all such computer software to reproduce, prepare derivative works, and perform publicly and display publicly, by or on behalf of the Government.

5.4.3 Data Rights

Except for copyrighted data, the Government shall normally have unlimited rights to data in Phase I, II, or III awards, such as:

(a) data specifically identified in the SBIR contract to be delivered without restriction;

(b) form, fit, and function data delivered under the contract;

(c) data delivered under the contract that constitute manuals or instructions and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under the contract; and

(d) all other data delivered under the contract.

According to Federal Acquisition Regulation 52.227-20, Rights and Data – SBIR Program (March 1994), the contractor is authorized to affix the following “SBIR Rights Notice” to SBIR data delivered under the contract:

SBIR RIGHTS NOTICE

These SBIR data are furnished with SBIR rights under Contract No. _____ (and subcontract _____, if appropriate). For a period of four years after acceptance of all items to be delivered under this contract, the Government agrees to use these data for Government purposes only, and they shall not be disclosed outside the Government (including disclosure for procurement purposes) during such period without permission of the contractor, except that, subject to the forgoing use and use by support contractors. After the aforesaid four-year period, the Government has a royalty-free license to use, and to authorize others to use on its behalf, these data for Government purposes, but is relieved of all disclosure prohibitions and assumes no liability for unauthorized use.

(END OF NOTICE)

The Government's sole obligation with respect to any properly identified SBIR data shall be as set forth in the paragraph above. The four-year period of protection applies for Phases I, II, and III.

5.4.4 Patents

Small business firms normally may retain the worldwide patent rights to any invention made with NOAA support. As described in more detail in FAR 52.227-11, NOAA receives a royalty-free license for Federal Government use, reserves the right to require the patent holder to license others in certain circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must substantially manufacture it domestically. To the extent authorized by 35 U.S.C. 205, NOAA will not make public any information disclosing a NOAA-supported invention to allow the contractor a reasonable time to pursue a patent (less than four years). SBIR awardees must report inventions that are planned to be patented to the SBIR Program Office, 1335 East West Highway, Room 106, Silver Spring, MD 20910.

5.5 Awardee Commitments

Upon the award of a contract, the contractor will be required to make certain legal commitments. The outline that follows illustrates the types of clauses to which the contractor would be committed. This list is not a complete list of clauses to be included in Phase I funding agreements, and is not the specific wording of such clauses. Copies of complete terms and conditions are available upon request.

(a) Standards of Work. Work performed under the contract must conform to high professional standards.

(b) Inspection of Work. Work performed under the contract is subject to Government inspection and evaluation at all reasonable times.

(c) Examination of Records. The Comptroller General (or a duly authorized representative) shall have the right to examine pertinent records of the contractor involving transactions related to this contract.

(d) Default. The Government may terminate the agreement if the contractor fails to perform the work contracted.

(e) Termination for Convenience. The Government may terminate the contract at any time if it deems termination to be in the best interest, in which case the contractor will be compensated for work performed and for reasonable termination costs.

(f) Disputes. Any dispute about the contract, which cannot be resolved by agreement, shall be decided by the Contracting Officer with right to appeal.

(g) Contract Work Hours. The contractor cannot require an employee to work more than eight hours a day or 40 hours a week, unless the employee is compensated accordingly (i.e., received overtime pay).

(h) Equal Opportunity. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

(i) Affirmative Action for Veterans. The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era.

(j) Affirmative Action for the Handicapped. The contractor will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.

(k) Officials Not to Benefit. No Government official shall benefit personally from any SBIR contract.

(l) Covenant Against Contingent Fees. No person or agency has been employed to solicit or secure the contract upon an understanding for compensation, except bona fide employees or commercial agencies maintained by the contractor for the purpose of securing business.

(m) Gratuities. The Government may terminate the contract if any gratuity has been offered to any representative of the Government to secure the contract.

(n) Patent Infringement. The contractor shall report each notice or claim of patent infringement based on the performance of the contract.

(o) American-Made Equipment and Products. When purchasing either equipment or a product with funds provided through the contract, purchase only American-made equipment and products to the extent possible, in keeping with the overall research needs of the project.

5.6 Additional Information

(a) Projects. The responsibility for the performance of the principal investigator, and other employees or consultants, who carry out the proposed work, lies with the management of the organization receiving an award.

(b) Organizational Information. Before award of an SBIR contract, the Government may request the proposer to submit certain organizational, management, personnel, and financial information to assure responsibility of the proposer.

(c) **Duplicate Awards. If an award is made under this solicitation, the contractor will be required to certify that he or she has not previously been, nor is currently being, paid for essentially equivalent work by any agency of the Federal Government. Severe penalties may result from such actions.**

(d) **It is recommended that upon submission of your proposal you obtain a Dun and Bradstreet Number. You will need this number to be eligible to receive an award. You can obtain this number free of charge by contacting Dun and Bradstreet by phone at 1-800-333-0505 or on-line at http://www.dnb.com/US/duns_update/index.html. In addition, all award winners will be required to fill-out on-line forms located at: http://www.ccr.gov/ and http://orca.bpn.gov/. It is required that these forms be filled out upon submission of the proposal. Within these forms please pay special attention to filling out the data required in the North American Industry Classification System (NAICS) and the Federal Supply Classification (FSC) portions of the forms. This will greatly expedite the contract award process.**

This program solicitation is intended for information purposes and reflects current planning. If there is any inconsistency between the information contained herein and the terms of any resulting SBIR contract, the terms of the contract are controlling.

5.7 Research Projects with Human Subjects, Human Tissue, Data or Recordings Involving Human Subjects

Any proposal that includes research involving human subjects, human tissue, data or recordings involving human subjects must meet the requirements of the Common Rule for the Protection of Human Subjects, codified for the Department of Commerce at 15 CFR Part 27. Any questions regarding these requirements should be addressed to Dr. Joseph M. Bishop. Telephone: 301-713-3565 or e-mail: joseph.bishop@noaa.gov.

5.8 Research Projects Involving Vertebrate Animals

Any proposal that includes research involving vertebrate animals (including fish) must be in compliance with the National Research Council's "Guide for the Care and Use of Laboratory Animals" which can be obtained from National Academy Press, 2101 Constitution Avenue, NW, Washington, D.C. 20055. In addition, such proposals must meet the requirements of the Animal Welfare Act (7 U.S.C. 2131 et seq.), 9 CFR Parts 1, 2, and 3, and if appropriate, 21 CFR Part 58. These regulations do not apply to proposed research using pre-existing images of animals or to research plants that **do not** include live animals that are being cared for, euthanized, or used by the project participants to accomplish research goals, teaching, or testing. These regulations also do not apply to obtaining animal materials from commercial processors of animal products or to animal cell lines or tissues from tissue banks.

6.0 SUBMISSION OF PROPOSALS

6.1 Deadline for Proposals

Deadline for Phase I proposal receipt (six copies) at the Central Region Acquisition Division is **4:00 p.m. (CST) on January 14, 2009.**

NOAA assumes no responsibility for evaluating proposals received after the stated deadline or that do not adhere to the other requirements of this solicitation (see 10.0 NOAA SBIR Checklist). Such proposals may be returned to the proposer without review.

Federal Acquisition Regulation (FAR 52.215-1) regarding late proposals shall apply.

Letters of instruction will be sent to those eligible to submit Phase II proposals. The Phase II proposals are due after receipt of the Phase I Final Report, approximately seven months after commencement of the Phase I contract.

Proposers are cautioned of unforeseen delays that can cause late arrival of proposals at NOAA, resulting in them not being included in the evaluation procedures. No information on the status of proposals under scientific/technical evaluation will be available until formal notification is made.

6.2 Proposal Submission

Hardcopy submission of NOAA proposals should be sent in six copies to:

ATTN: SBIR Proposals
U.S. Department of Commerce, NOAA
Central Region Acquisition Division
601 E. 12th Street, Room 1756
Kansas City, Missouri 64106

Telephone: 816-426-6823

Acknowledgment of receipt of a proposal by NOAA will be made. All correspondence relating to proposals must cite the specific **proposal number** identified in the acknowledgment.

(a) **Packaging: Secure packaging is mandatory. NOAA cannot process proposals damaged in transit. All six copies of the proposal must be sent in the same package. Do not send separate "information copies," or several packages containing parts of a single proposal, or two packages of six copies of the same proposal. The top copy must be signed as an original by the principal investigator and the corporate official. Other copies may be photocopies.**

(b) **Bindings: Do not use special bindings or covers**. Staple the pages in the upper left hand corner of each proposal. Separation or loss of proposal pages cannot be the responsibility of NOAA.

6.3 Warning

While it is permissible, with proper notification to NOAA, to submit identical or essentially equivalent proposals for consideration under numerous Federal program solicitations, it is unlawful to enter into contracts requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.

7.0 SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

7.1 General Information

The following web pages may be sources for additional technical information:

http://www.noaa.gov http://www.lib.noaa.gov

7.2 Oceanography and Marine Science

Scientific information in the areas of oceanography and marine science may be obtained from organizations shown in the website http://www.nsgo.seagrant.org/SGDirectors.html

8.0 RESEARCH TOPICS

8.1 TOPIC: ECOSYSTEMS

8.1.1N SUBTOPIC: Tissue Culture Technology for Eelgrass Restoration

This solicitation seeks the development of technologies to improve the culture of seagrass plants for habitat restoration purposes. Eelgrass (*Zostera marina and Thalassia sp.*) beds provide habitat for a variety of marine life, including species important to coastal economies. Additionally, they are a key component of some of NOAA's trust resources. Nationwide, coastal managers recognize the importance of healthy eelgrass beds and are calling for tools to restore and protect them. One obstacle to restoration is obtaining seeds or plants to populate a new bed. Seed and plant sources local to the restoration site stand the best chance of survival, but healthy donor beds are often in short supply.

Methods for developing a reliable, genetically diverse supply of eel grass seeds and plants for restoration are needed. Tissue culture techniques have long been employed to develop plant materials for wetland and salt marsh restoration. However, tissue culture methods have not been adapted to the particular challenges of propagating eelgrass.

Success criteria for this technological approach would include the ability to generate a reliable supply of genetically diverse plant material specific to different restoration sites consequently reducing dependence on donor beds to conduct seagrass habitat restoration work. The technique should consider both *Z. marina* and *Thalassia* species. This project should also investigate the use of this technique to 'bank' specific genetic variations for high-risk areas that may experience planned (dredging) or natural disturbance and require future restoration.

References:

Li, X., Gallagher, J., 996. Tissue culture and plant regeneration of big cordgrass, *Spartina cynosuroides*: Implications for wetland restoration. Wetlands. Vol. 16, No. 4, pp. 410-415.

Wang J, Seliskar D, Gallagher J., 2003. Tissue culture and plant regeneration of *Spartina alterniflora*: Implications for wetland restoration. Wetlands: Vol. 23, No. 2 pp. 386–393.

8.1.2N SUBTOPIC: Coral Cell-Culture and Tissue-Culture Lines

Coral reefs are valuable assets for commerce (e.g., medicinal, aquarium trade), economic stability and protection of island communities and nations, however they are degrading rapidly over the last several decades. This opportunity seeks methodologies and *in vitro* propagated sources of coral tissue as an alternative to wild harvest of corals. To meet the opportunity objectives will require development of methods that successfully produce sustainable culturing of scleractinian coral cells and tissues lines for *in vitro* propagation and experimentation. The products of such methods are needed as laboratory research models; creation and maintenance of genetically distinct lines; and as an alternative to wild-captured specimens in support of conservation and restoration efforts. There is a broad application for technologies that create such a marine invertebrate model system, e.g., for educators in marine biology; researchers in cell biology, genetics, biochemistry and physiology; in the field of toxicology as a cell-culture based system for screening environmental toxicants in marine waters; chemical, pharmaceutical and natural products industries to screen and selection of novel compounds. The availability of *in vitro* propagated corals provides an alternative for the aquarium trade to wild-harvested corals and an opportunity to develop 'designer' corals, unavailable from the wild. Acceptable cell cultures may consist of undifferentiated or differentiated cell types able to be maintained under defined *in vitro* tissue culture conditions and have defined characteristics of scleractinian corals. Tissue explants are also desirable which are able to grow and differentiate into polyps with defined tissue-culture conditions that allow characteristic polyp development with or without skeletal formation of the characteristic aragonite crystalline structure, as well as maintaining normal reproductive characteristics. A successful applicant will produce lines of either scleractinian cells, tissues and/or polyps, cloned from genetically distinct parental material thus enabling the production of individual lines that are each genetically distinct. It is expected that the successful applicant will be able to provide multiple genetic lineages. The methodology must also be amenable to mass propagation of the individual products (i.e., cell lines, tissues or polyps). The development of this technology would provide a vital resource to academia, government and industry in providing a marine invertebrate model system as well as medical products for bone replacement treatments (particularly in dentistry). Candidate species of interest include, but are not limited to Porites, Montastraea, Acropora, Stylophora, Pocillopora or Fungia.

References:

Boschma H (1923) Experimental Budding in *Fungia fungites. Proc. Knon. Ned. Akad Wet. Amsterdam* 26:88-96.

Domart-Coulon I, Tambutte´ S, Tambutte´ E, Allemand D (2004) Short term viability of soft tissue detached from the skeleton of reef-building corals. *J Exp Mar Biol Ecol* 309:199–217.

Kramrasky-Winter E, Loya,Y (1996) Regeneration versus budding in fungiid corals: a trade-off. *Mar Ecol Prog Ser* 134:179-185.

Krupp DA, Hunter CL, Jokiel PL, Neves E, Gillette PA (1997) In search of the phoenix: regeneration of cryptic residual tissue in Hawaiian reef corals subjected to osmotic stress. *Am Soc Zoo.*

Krupp, DA, Jokiel PL, Chartland TS (1993) Asexual reproduction by *Fungia scutaria* on dead coralla in Kanehoe Bay, Oahu Hawaiian Islands. Proc. of 7th Int. Symposium Coral Reef. Guam (1992) 1:527-534.

Muller WE, Dorn A, Uhlenbruck G (1985) The molecular mechanisms of the distinct calcium dependent aggregation systems in marine sponges and corals. *Acta Histochem Suppl.* 31:37-46.

Sammarco, PW (1982) Polyp Bail-out: An escape response to environmental stress and a new means of reproduction in corals. *Mar Ecol Prog Ser.* 10:57-65.

Shafir S, Van Rijn J, Rinkevich B (2001) Nubbing of coral colonies: A novel approach for the development of inland broodstocks. *Aquarium Sci Conserv* **3:** 183–190.

Shafir S, Van Rijn J, Rinkevich B (2006) Steps in the construction of underwater coral nursery, an essential component in reef restoration acts. *Mar Biol*. 149: 679–687

8.1.3N SUBTOPIC: Rapid Test and Observing System Sensors for Harmful Algal Blooms (HABS)

Harmful algal blooms (HABs) present one of the most scientifically complex and economically significant coastal management issues facing the nation today. HABs include blooms of algae that produce potent toxins that cause massive fish kills, marine mammal deaths, and human illness. In the U.S. toxic blooms are known to cause a number of illnesses including Ciguatera Fish Poisoning, Diarrhetic Shellfish Poisoning, Neurotoxic Shellfish Poisoning, Paralytic Shellfish Poisoning, and Amnesic Shellfish Poisoning. For more information on U.S. HAB problem visit http://www.whoi.edu/redtide/page.do?pid=9257

Defining the primary forcing factors and time and space scales that cause HABs in coastal, ocean and Great Lakes regions requires the ability to detect HAB species and their toxins. Methods for detecting harmful algal bloom (HAB) toxins and toxigenic species are generally laborious, time-consuming and require expensive laboratory equipment. In order to improve HAB monitoring and prediction, there is a need for sensors for rapid, accurate, and easy HAB detection for a variety of purposes. State and federal resource managers are often required to make quick decisions to protect human health with limited data so there is a need for quick, accurate tests for toxins or HAB cells that can be easily used in the field. Forecasts of HAB events depend on predictive models that require data about the temporal and spatial variation of HAB cells and toxins in the water. Currently, much of this information is obtained from ship board sampling. As ocean observing systems that use, for example, towed instruments,

moorings or AUVs, are put in place, there is a need for in-water sensors that can detect HABs cells and toxins.

This solicitation is open to development of two different types of sensors: quick tests for HAB toxins and cells and sensors designed for ocean observing system platforms.

(1) Quick tests for HAB cells and toxins: The ultimate goal is to develop methods for inexpensive, accurate, rapid, detection of toxins in HAB cells, water, or animal tissue and/or toxigenic organisms specific to a given geographical region and at multiple levels near and below regulatory limits. Target end-users may include both monitoring technicians and non-technical citizen monitors, but use of the tests should not require extensive training. Methods that facilitate the decision process for resource managers without meeting all of the goals will also be considered. Proposals must specify the target toxin and matrix, species and geographic region. Some participants in the project must demonstrate prior experience developing methods for detection of HAB toxins or toxigenic species. Applicants should also demonstrate awareness of regulatory limits of cell and toxin detection and are encouraged to consult with members of the scientific and management community working to understand HABs, their toxins and how to improve efforts to mitigate their impacts.

(2) Sensors for ocean observing systems: Sensors for HAB cells and toxins should be designed to be deployed as part of an observing system. These sensors should be based on detection methods that have already been developed and tested in other HAB applications. Sensors must be specific for a particular HAB so sensors measuring chlorophyll or other major pigment groups are not eligible. It is desirable, but not required, that the design be targeted to an existing observing system, either already in use or well along in the planning process. If not targeted to a specific system, some of the participants must have specific experience with developing *in situ* sensors or observing systems. The proposal must address the engineering as well as the methodology to be used, including power usage and communications.

References:

HARRNESS, 2005. *The* Harmful Algal Research and Response: A National Environmental Science Strategy 2005–2015. Ramsdell, J.S., D.M. Anderson and P.M. Gilbert (Eds.), Ecological Society of America, Washington DC, 96 pp.

Jewett, E.B., Lopez, C.B., Dortch, Q., Etheridge, S.M. 2007. National Assessment of Efforts to Predict and Respond to Harmful Algal Blooms in U.S. Waters. Interim Report. Interagency Working Group on Harmful Algal Blooms, Hypoxia, and Human Health of the Joint Subcommittee on Ocean Science and Technology. Washington, DC.

8.1.4 R, F SUBTOPIC: Diver Air Pressure Safety Alert System

The NOAA diving program and the wider diving community would benefit from the SBIR development and production of a device that provides the diver a visual and audible alarm when their air supply is getting low. Given the extensive commercial market for recreational diving equipment it is expected that development of this piece of safety gear would continually be in demand and become standard equipment for scuba diving. Each year over 700 NOAA employees, contractors, and grantees perform 25,000+ dives throughout the oceans of the world and inland waters of the United States in support of NOAA's mission. The majority of these dives are performed using self-contained underwater breathing apparatus, or SCUBA, diving systems. Unlike divers that receive unlimited compressed air through hoses from the surface, SCUBA divers are limited by the amount of air they carry on their backs in high-pressure tanks. Pressure gauges worn by divers enable them to monitor the amount of air remaining in their SCUBA tanks. The amount of time a diver can stay under water depends on many variables including: the amount of breathing gas carried, depth, exertion level, fitness, experience of the diver, temperature, etc. Divers must remain cognizant of the amount of gas remaining in their cylinders to ensure that they have enough air to safely return to the surface. The normal practice is for divers to return to the surface with 500 psi remaining in their cylinders. However, the inherent problem with this practice is that it is passive, that is, it requires action by the divers. Although divers are taught to frequently monitor their tank pressure during dives, many distractions can avert their attention away from this critical task. The device proposed by this SBIR announcement would actively monitor divers' air supply and alert them of impending low-pressure levels; thus, allowing divers to end their dives and return to the surface before running out of air. As conceived, the diver air pressure alert system would consist of two parts: 1) a sending unit mounted on the diver's first-stage SCUBA regulator, and 2) a small receiving unit clipped to the front of the diver's buoyancy compensator or affixed to one of the diver's air hoses. The sending unit would transmit tank pressure information to the receiving unit wirelessly where a visual alert (i.e. light) would be displayed and an audible sound produced when tank pressure reached predetermined values - nominally 750 psi and 600 psi. The unit would be capable of operating to 300 feet; powered by a user replaceable, commercial off-the-shelf battery with a low battery warning; water and/or pressure activated; testable prior to diving; of sleek design to minimize the potential for fouling; capable of operating in salt water or fresh water at water temperatures of 28 - 100 degrees F, and air temperatures of 0 - 150 degrees F and compatible with various breathing mixtures including 100% oxygen, nitrogen-oxygen, nitrogen-oxygen-helium or helium-oxygen at all mix ratios. Also, alarms would be capable of being seen and heard by the diver's buddy located 25-feet away.

8.1.5R SUBTOPIC: Microsensors for Marine Chemical and Microbial Measurements

The purpose of this research is to develop a prototype marine instrument deployable on fixed, towed or autonomous platforms capable of providing chemical compound or microbial identification and quantification. Identifying and quantifying microbes and the chemical compounds that make up marine nutrients and contaminants currently

requires time consuming and costly field sample collection and laboratory analyses. Microsensors manufactured with techniques derived from the integrated circuit industry represent an opportunity to develop next-generation marine sensors with improved measurement capabilities at lower cost. Technologies such as conducting organic polymers, quartz crystal microbalance, surface acoustic-wave, and silicon integrated circuit structures can be applied in the marine environment to allow direct extraction of data in the field or to provide survey information during field sampling efforts. These technologies do not employ colorimetric measurement requiring chemical reagents. Instrumentation utilizing this technology will be applicable to marine environmental research, environmental monitoring, harmful algal blooms (HABs) research, and municipal drinking water quality assessment.
Proposals will be considered addressing single or combinations of the following contaminants and nutrients of interest:

	Range	Resolution
Persistent Organic Contaminants	0-1 ppm	1 ppt
Phosphate	0.5-3.0 ug P/L	0.1 ug P/L
Silica	0.1-2.0 mg SiO2/L	0.1 mg SiO2/L
Dissolved Oxygen	0-12 mg/L	0.01 mg/L
Nitrate-nitrogen (NO3)	0.01 - .5 mg N/L	0.01 mg N/L
Ammonium-nitrogen (NH4)	5 - 50 ug N/L	1.0 ug N/L
Chloride	10-50 ug Cl/L	1.0 ug Cl/L
Microcystin (HAB)	0.1 – 5 ug/L	0.1 ug/L

8.1.6F SUBTOPIC: Development of Small-Scale Satellite Tags to Characterize Long-term dispersal Patterns and Habitats of Small Sea Turtles and Other Epipelagic Marine Species and Sea Birds

To date, the tracking of animals on a large temporal and global scale has yielded spectacular information on those species and the ecosystems which they inhabit. These data, however, are restricted to large animals due to power and size constraints of the transmitters. There is a need to develop similar technology for smaller species or life stages because they often are subjects of evolutionary and ecological study and serve important roles in ecosystems. Many are protected species, yet because of their small size, long-distance migrations and long-term dispersal, little is known about their biology, even during the first weeks to months they spend at sea. Large-scale and localized oceanographic features profoundly influence behavior and dominate the “landscape” in which marine vertebrates including sea birds, pinnipeds, sea turtles, and many fish live. To meet conservation goals, it is critical to identify and understand spatial and temporal life history variation (survival, risks). These needs are articulated well by Wikelski et al. (2007).

Species recovery requires a robust understanding of spatial distributions, population dynamics, and life stage-specific survival. Yet, technological limitations leave major data gaps. For example: neonate sea turtle tracking studies are directly limited by the lack of small-scale transmitters capable of remotely recording the animals' positions and the environmental conditions of their habitats over weeks, months, or longer. Existing data for neonate sea turtles are few, span less than a week (most are less than a few hours) and are based on labor-intensive visual observations. With the exception of a few hatchlings tracked for just up to three days, migratory paths and behavior data are extremely limited in sample size, duration and species. Yet we know that many are capable, as small juveniles, of traversing entire ocean basins. The early life history of sea turtles often is defined as the "lost years". Similarly, the migratory details of some marine mammals, sea birds and marine fish remain restricted by transmitter and battery size.

Filling data gaps for small highly dispersed species or life stages requires a ***new technological approach***. This approach should include, but is not limited to, small-scale satellite tags that are compatible with existing satellite communication systems such as ARGOS systems or near-earth orbiting satellite tracking system and tag technologies similar to those proposed by the **I**nternational **C**ooperation for **A**nimal **R**esearch **U**sing **S**pace initiative (ICARUS; http://www.icarusinitiative.org/), or any alternative, affordable technologies that target remote tracking of small animals <45g over large geographic and temporal scales (Swensen et al. 2004, Mycroft and Savin 2007).
Technological need:

- Phase I, the initial test system should be designed for use with neonate sea turtles (e.g. loggerhead sea turtles ranging from 14-18 g and leatherback turtles ranging from 32 to 45 g).
- Tags must weigh less than 5% of the turtles' or other animals mass in air, so tags may range from <1g to 2g in weight. Small size tags must have sufficient transmission power and sufficient data and power storage to transmit to lower orbit satellites over a time period measured in months to years
- Tags must be compatible with existing ARGOS systems, or the proposed ICARUS data retrieval systems, or must be developed in conjunction with alternative methods of remotely sensing tags attached to highly migratory species.
- Tags must be capable of withstanding the marine environment and depths to 1000 m
- Phase II, the field phase, will involve deploying tags on wild animals in the marine environment for testing of tag/system functionality, durability, and data quality.

NOAA Fisheries Needs: The availability of small-scale tracking technologies as described above will allow NOAA Fisheries scientists and managers to define early life-stage dispersal patterns and temporal distribution of sea turtles and other small managed species, in the wild, and will (1) allow for habitat assessments, refine estimates of survivorship, identify fisheries interaction risk and other anthropogenic and natural threats, and (2) contribute to a better understanding of life histories. The data

needs these new technologies would address will significantly contribute to the development and refinement of robust management strategies. This technological development request addresses both data needs and technology gaps identified by NMFS biologists and managers.

Expected Outcome: This new technology has direct relevance to the conservation and management of many species. The development of new, small scale technology will find immediate application in addressing major data gaps in our understanding of neonate life stages of all sea turtles. Defining early life-stage dispersal patterns will allow for oceanic habitat assessments, refined estimates of survivorship, spatially explicit risk identification, and will enhance our understanding of recruitment among life stages. We fully expect this same small-scale technology to be adapted for use on other managed marine species that spend time near the surface, such as small marine mammals, certain fishes (e.g. salmonids, billfish, and sharks), swimming crabs, and sea birds, as well as in terrestrial applications. Such broad appeal will contribute to the tag and system's commercial viability.

There is strong potential for interdisciplinary and cooperative consortium-building among ecologists, oceanographers, federal and state managers and industry. For example, the proposed ICARUS system counts among is supporters NASA's Goddard Space Center and Princeton University. Novel methods for observing the in-water behavior and dispersal of neonate sea turtles will set the stage for applications to other small marine and terrestrial organisms. This proposal will provide the technological advances needed to fill major data gaps, increase sample sizes in species that are otherwise difficult to study, and empower agency personnel to develop the most robust management regimes enhance species recovery.

References:

Mycroft, F. and S. Savin. 2007. Tracking the migratory patterns of small animals from space: designing the communications link. Thesis, Princeton University Department of Mechanical and Aerospace Engineering, 130 p.

Wikelski, M. R.W. Kays, N.J. Kasdin, K. Thorup, J.A. Smith, and G.W. Swenson, Jr. 2007. Going wild: what a global small-animal tracking system could do for experimental biologists, The Journal of Experimental Biology, 210, 181-186.

Swenson, G.W., M. Wikelski and J.A. Smith. 2004. Tracking very-low-power ground transmitters from near Earth orbit. IEEE International Geosciences and Remote Sensing Symposium. Anchorage, Alaska. 19-24 September 2004.

8.1.7F SUBTOPIC: As Film Based Camera Systems Give Way to Digital Cameras, Inexpensive Systems Must be Developed to Allow Scientists to Collect High Resolution Images from Aircraft Flying at High Speeds and Low

To collect the data necessary to monitor the status of marine mammal populations protected under the Marine Mammal Protection Act and/or the US Endangered Species Act, scientists have had to develop sampling techniques that minimize the impact of the data collection on the species studied. Vertical aerial photography has been a major component of survey efforts on cetaceans and pinnipeds (and birds). Photographic data provided much more reliable counts of animals in large aggregations and also provides data for measurements of individuals or areas occupied by breeding groups. Unfortunately, most of the aerial photographic efforts have relied on large to medium format camera systems that provide broad coverage in a single frame and often include an image motion compensation system to eliminate the loss of image resolution resultant from the forward movement of the aircraft while the shutter is open. These old film cameras are no longer supported by manufactures and sources of high resolution large format films are very few. While the development of modern digital systems have produce chips which provide excellent resolution, these chips are (35 mm) which significantly limits the applicability of these systems when sampling animals that may be in aggregations of several thousand individuals. We request a Phase I study to develop a design and working model of a multiple digital camera mount that can support 3 small format cameras, fire them simultaneously, provide 60% overlap between adjacent frames and 10% side lap between cameras, and move the cameras as they fire to eliminate image motion from the aircraft.

References:

Perryman, W. L. and M. S Lynn. 1993. Identification of geographic forms of common dolphin (*Delphinus delphis)* from aerial photogrammetry. Marine Mammal Science 9:119-137.

Perryman, W. L. and R. L. Westlake. 1998. A new geographic form of the spinner dolphin (*Stenella longirostris)*, detected with aerial photogrammetry. Marine Mammal Science 14:38-50.

Snyder, G. M., Pitcher, K. W., Perryman, W. L. and M. S. Lynn. 2001. Counting steller sea lion pups in Alaska: An evaluation of medium-format color aerial photography. Marine Mammal Science 17:136-146.

Perryman, W. L. and M. S. Lynn. 2002. Evaluation of nutritive condition and reproductive status of migrating gray whales (*Eschrichtius robustus*) based on analysis of photogrammetric data. J. Cetacean Res. and Manage. 4:155-164.

8.1.8F SUBTOPIC: Aquaculture: Sustainable Marine Aquaculture Operations

The purpose of this topic is to develop innovative products and services to support the development of environmentally, socially, and economically sustainable marine aquaculture in the United States. The focus is on food, stock enhancement, ecological remediation, pharmaceutical and nutriceutical, biofuel, and other commercial products and services that will allow the U.S. aquaculture industry to expand in a way that is compatible with healthy marine ecosystems and other users of coastal and ocean resources.
As marine aquaculture technology moves from research to operations, there is a critical need to provide commercial products and services to aquaculture producers at a cost that does not jeopardize the economic viability of the industry. This includes, but is not limited to, methods, tools, instruments, technologies, and equipment for:

- Producing marine fish, shellfish, algae, and other species in hatcheries
- Selecting appropriate sites for marine aquaculture operations
- Raising marine fish, shellfish, algae and other species to market size in land-based, coastal, or open-ocean grow-out facilities
- Preventing, diagnosing, and controlling disease
- Meeting the nutritional requirements of marine species in all life stages (from hatchery to market size), including use of diets that rely less on fish oil and fish meal without sacrificing the human health benefits of seafood consumption
- Improving the performance of culture species through breeding and other genetic tools
- Preventing or reducing effluents and escapes from marine aquaculture facilities
- Excluding predators from aquaculture facilities in ocean and coastal waters
- Mitigating environmental impacts

References:

Nash, C.E., 2004. Achieving Policy Objectives to Increase the Value of the Seafood Industry in the United States: The Technical Feasibility and Associated Constraints. Food Policy 29, 621-641.

National Marine Fisheries Service, 2007. Summary of the National Marine Aquaculture Summit. Available at http://aquaculture2007.noaa.gov/pdf/summitsum_web_1_08.pdf

National Oceanic and Atmospheric Administration, 2007. NOAA 10 Year Plan for Marine Aquaculture. Available at http://aquaculture.noaa.gov/pdf/finalnoaa10yrrweb.pdf

8.1.9F SUBTOPIC: Aquaculture: Sustainable Marine Aquaculture Management

The purpose of this topic is to develop innovative products and services to support the development of sound marine aquaculture management tools for the United States.

As marine aquaculture technology moves from research to operations, there is a need for resource managers and regulators at the federal, state, and local level to have access to affordable equipment, instruments, tools and techniques to assess the potential risks and benefits of marine aquaculture facilities and to monitor the impacts of marine aquaculture operations on marine ecosystems. This includes, but is not limited to, methods, tools, technologies, and equipment for:

- Analyzing the risks associated with marine aquaculture production
- Evaluating proposed sites for marine aquaculture facilities
- Monitoring operations and their environmental impacts
- Analyzing genetic differences between farmed and wild, and providing methods to distinguish the two

References:

Nash, C.E., 2004. Achieving Policy Objectives to Increase the Value of the Seafood Industry in the United States: The Technical Feasibility and Associated Constraints. Food Policy 29, 621-641.

National Marine Fisheries Service, 2007. Summary of the National Marine Aquaculture Summit. Available at http://aquaculture2007.noaa.gov/pdf/summitsum_web_1_08.pdf

National Oceanic and Atmospheric Administration, 2007. NOAA 10 Year Plan for Marine Aquaculture. Available at http://aquaculture.noaa.gov/pdf/finalnoaa10yrrweb.pdf

8.1.9SG SUBTOPIC: Development of Resilient Structures and Infrastructure Systems Using Advanced Building Technologies

One of the focus areas for the National Sea Grant College Program is to develop tools that will limit the impacts of natural hazards (Hurricanes', Tsunamis', Coastal Erosion) on the coastal communities of the United States. Despite improvements in building materials in recent years most damage reported is a result of damaged roofs and soffits as a result of high wind.

NOAA is looking for proposals to develop new building methods and materials that can be utilized in both the retrofitting and new construction of structures in coastal areas to reduce the wind and water damage sustained during severe these weather events.

8.1.10SG SUBTOPIC: Aquaculture: Developing and Improving Species Culture

Proposals are requested for research, which offers to make significant, industry-wide improvements in finfish, shellfish, and ornamental species systems for both small scale and large-scale applications, including gaining access to harvest areas and growing areas through improved monitoring and through processing techniques. Priority will be given to research, which finds innovative approaches that will solve major industry bottlenecks in an economically and environmentally compatible manner. Research aimed at new species for culture and research to adapt techniques being used successfully in other countries is appropriate.

8.1.11SG SUBTOPIC: Aquaculture: Culture for Marine Organisms For Marine Natural Products

Research in the past two decades has found that there are many marine organisms which produce novel natural products of use in treating human diseases. To utilize these products commercially and in clinical trials, however, they need either to be chemically synthesized, produced using biotechnology, or produced through aquaculture of organisms. Research is needed to find economically cost-effective and biologically viable ways to culture marine organisms specifically for their production of novel natural products.

8.2 TOPIC: CLIMATE

8.2.1C SUBTOPIC: Autonomous Dissolved Inorganic (DIC) and Total Alkalinity (TAlk) Measurement Systems for Profiling and Mooring Systems

As a result of the industrial and agricultural activities of humans, current atmospheric CO_2 concentrations are around 380 ppm and increasing at about 0.5% per year. The global oceans are the largest natural reservoir for this excess carbon dioxide, absorbing approximately one-third of the carbon dioxide added to the atmosphere by human activities each year. It is now well established that there is a strong possibility that the partial pressure of CO_2 in the ocean surface will double over its pre-industrial value by the middle of this century. While this uptake reduces the greenhouse effect in the atmosphere, it also results in a change in the acidity (pH) of the ocean water at a rate not seen in the last tens of millions of years. It is important to closely monitor, understand and predict this process, since it could have drastic impacts on marine life and on future CO2 uptake by the ocean.

The NOAA Climate Program Office is interested in developing autonomous instruments to measure the inorganic carbon system parameters that control the ocean's acidity level. Precision instruments for dissolved inorganic carbon (DIC) and/or total alkalinity (TAlk) would be particularly useful. The instrument must have the potential do be deployed either on coastal or open-ocean buoys, or on profiling floats or CTD-rosette systems. The instrument does not necessarily have to be capable of deployment on all of these platforms, but versatile designs that can be deployed on more then one

platform are preferable. Single parameter analyzers for either DIC or TAlk that meet the specifications listed below are entertained. Innovative system designs that can measure both parameters are encouraged. Potential customers include NOAA as well as national and international investigators studying the impacts of ocean acidification.

The system designs need to be compact and flexible enough to be readily mounted on a variety of CTD/Rosette cages and moorings. Systems should have the capability to either log internally, or transmit data to the surface via the CTD conducting cable. The systems should have the option to be powered internally or externally. The systems need to be able to operate under a wide range of environmental conditions. The profiling systems must have a sampling rate of better than once every 6 seconds for deployments of up to 4 hours. The moored systems must be capable of sampling every 3 hours for up to a year at a time without servicing. Dissolved inorganic carbon systems must be accurate to 4 µmoles/kg or better at each sampling point (i.e. every 3h for moorings and every 6s for profiling). Total alkalinity systems must be accurate to 5 µmoles/kg or better at each sampling point. Calibration traceable back to standard reference materials from Scripps Institution of Oceanography is desirable.

8.2.2C SUBTOPIC: Real-Time Measurements of Gas Phase Carbon Dioxide and Methane Isotopes

Monitoring of atmospheric carbon is vital for understanding changes in the Earth's climate. In particular, understanding the variations of atmospheric sources and sinks of carbon is crucial for gaining predictive ability of future climate change. Gas phase carbon dioxide (CO_2) and methane (CH_4) are the two most prevalent carbon species in the atmosphere. Atmospheric sources and sinks perturb the ratios of the isotopes of CO_2 and CH_4 in various ways; monitoring the isotopic ratios of CO_2 and CH_4 allows for insight into the processes governing the concentration of these species that measuring just the concentration cannot provide. Currently NOAA has a monitoring program for CO_2 and CH_4 isotopes using discrete flask samples taken every 7 days. Compared to discrete samples, continuous concentration measurements on stationary and mobile platforms have substantially added to our knowledge of the magnitude of their surface sources and sinks. If technology can be developed for the continuous analysis of the stable isotope ratios (^{13}C:^{12}C, ^{18}O:^{16}O, ^{2}H:^{1}H) for CO_2 and CH_4 at lower detection limits than currently available in the marketplace, great strides could be made in the understanding of the processes driving their source and sink variations. The developed instrumentation would potentially be deployed at tower stations used within NOAA's tall tower network (http://www.esrl.noaa.gov/gmd/ccgg/towers/) and/or background stations within NOAA's background observatory network (http://www.esrl.noaa.gov/gmd/ccgg/insitu.html), but may eventually be used on board light aircraft for measuring vertical profiles of these isotopic ratios.

Instrument developers should be aiming for measurements of CO_2 and CH_4 isotopes at ambient concentrations that achieve the following detection limits (expressed in typical isotopic delta notation in units of per mil) on relatively short time scales (on the order of minutes):

$\delta^{13}C$ CO_2: 0.05 per mil
$\delta^{18}O$ CO_2: 0.1 per mil
$\delta^{13}C$ CH_4: 0.1 per mil
$\delta^{2}H$ CH_4: 0.5 per mil

8.2.3 C SUBTOPIC: Numerical Integration Packages for Stochastic Models

Stochastic Processes in Numerical Prediction Models - Current estimations of uncertainty in numerical model output rely almost exclusively on varying the initial conditions, and the uncertainty in the model itself is not adequately, if at all, addressed in the context of operational prediction models. Quite a lot of research has been done, by scientists belonging to NOAA and the educational sector, on the theoretical and numerical aspects of using stochastic parameterizations to account for this model error (citations, too many to list here, are available on request). Stochastic parameterizations involve specialized mathematical techniques for integrating stochastic differential equations (Rümelin 1982; Kloden and Platen 1992; Hansen and Penland 2006), and numerical techniques have already been derived for the particular class of numerical prediction models currently used in operational forecast centers (Ewald, Penland and Témam 2004). Although these techniques have been described mathematically, practical software for their implementation has not yet been developed. The need exists for stochastic software specialists to develop and supply numerical routines using algorithms for which the stochastic convergence is known. As a first step, suppliers could provide modular integration routines of various types for smaller models. There is likely to be a commercial demand for general numerical integration packages for use with stochastic differential equations. Requirements include a variety of integration techniques, both implicit and explicit, and sufficient documentation to guide the user on physical criteria for choosing a calculus (i.e., Ito or Stratonovich), as well as the ability to handle that choice.

References:

B. Ewald, C. Penland, and R. Témam, 2004: Accurate Integration of Stochastic Climate Models with Application to El Niño. *Mon. Wea. Rev.*, **132**, 154–164.

J.A. Hansen and C. Penland, 2006: Efficient Approximate Techniques for Integrating Stochastic Differential Equations. *Mon. Wea. Rev.*, **134**, 3006-3014.

Kloeden P. E., and E. Platen, 1992: *Numerical Solution of Stochastic Differential Equations*. Springer-Verlag, 632 pp.

Rümelin W., 1982: Numerical treatment of stochastic differential equations. *SIAM J. Numer. Anal.*, **19**, 604–613.

8.2.4D SUBTOPIC: Geospatial Database for Storm Risk Assessment

There is a very large research focus on the climate, extreme weather events, and planning for storm risk. Climate is more than average temperature and precipitation. It's also defined by the type, frequency and intensity of weather events. Severe weather impacts the lives of millions of people each year. The protection, planning, and response to these challenges are central to NOAA's mission. Part of this mission includes disaster planning, mitigation, and recovery which is often atop public perception and occupies many of NOAA's resources. Better preparedness and improved recovery can help save lives, reduce costs, and provide comfort. The development of **Nex**t Generation **Rad**ar (NEXRAD) systems has dramatically improved severe weather detection. Algorithms developed at NOAA use NEXRAD data to detect and track tornados, hail, and mesocyclones in real-time. While these data are invaluable for real-time operations, historical analysis using other independent data sources is also essential to planning for storm risk. A compelling need exists to assess storm risk by deriving severe weather data products (e.g. climatologies). This includes trend analysis and risk assessment of storms (including hurricanes, tornadoes, drought, floods, lightning, and hail) and storm reports with damage. Utilities (including tools to query multiple interoperable databases) are needed to map these spatially against social and demographic databases to assess populations at risk. Access systems need to take advantage of data decoders, geospatial databases, and data servers to provide a user friendly and efficient manner in which to access the data of need. Derived products based on retrospective data, such as flash flood climatology and other storm products need to be stored in a manner that they are directly accessible and applicable to decision making engagement sites for planning needs of national, state and local government emergency response.

This is a unique approach for deriving storm risk assessment products that can be leveraged by other hazardous weather software toolkits. For example, the Federal Emergency Management Agency (FEMA) has a tool named HAZUS-MH which is a risk assessment tool that analyzes potential losses from floods, hurricane winds and earthquakes. While HAZUS is a modeling and mapping tool for risk assessment, the proposed Geospatial Database for Storm Risk Assessment is a data management system for severe weather data that creates storm risk assessment products. These products could be integrated into HAZUS via standards-based web services. This allows HAZUS to easily integrate new datasets and models without worrying about the data management (formats, projections, etc...). Also, other private sector companies that support themes such as risk management (insurance and reinsurance) will be able to use the storm risk geospatial database to easily access information and climatological products mined from petabytes of archived data. Many of these datasets are currently not used due to the size and complexity of the raw data. Standards-based web services will allow the seamless integration of the database into custom applications developed by these companies.

References:

Ansari, S., M. Phillips., and S.A. Del Greco, 2007: A Geospatial Database and Climatology of Severe Weather Data. *88th AMS Annual Meeting, combined preprints CD-ROM, 20-24 January 2008, New Orleans, LA, 22nd Conference*

IIPS [International Conference on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology], American Meteorological Society, Boston, Mass.

Ansari, S., S.A. Del Greco, B. Nelson and H. Frederick, 2006: The Severe Weather Data Inventory (SWDI): Spatial Query Tools, Web Services and Data Portals at NOAA's National Climatic Data Center (NCDC). *86th AMS Annual Meeting, combined preprints CD-ROM, 30 January – 3 February 2006, Atlanta GA, 22nd Conference IIPS [International Conference on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology]*, American Meteorological Society, Boston, Mass., File 11.4, 9 pp. (February 2006).

HAZUS: http://www.fema.gov/plan/prevent/hazus/

U.S. Climate Change Science Program (CCSP), 2007. Review of the U.S. Climate Change Science Program's Synthesis and Assessment Product *3.3: Weather and Climate Extremes in a Changing Climate* (http://books.nap.edu/catalog.php?record_id=11973)

8.2.5D Subtopic: Hyperspectral Image Projection System (HIPS) for Satellite Sensor Pre-Launch Characterization

Satellite sensors have become increasingly sophisticated due to technological advances and user demands. Pre-launch characterization of satellite sensors, on the other hand, has not progressed accordingly. Typical radiation sources, such as an integrating sphere or cavity blackbody, for sensor characterization are spatially homogeneous and spectrally smooth. Such characteristics are rarely found in reality. These critical shortcomings of such radiation sources may allow a satellite sensor to adequately meet pre-launch requirements only to perform poorly on-orbit. This is a profound issue affecting all satellite sensors involved with climate data collection.

This subtopic seeks the development of a Hyperspectral Image Projection System (HIPS) that fills a gap in characterizing future satellite sensors. By simulating spectrally and spatially complex "structured" scenes that would be viewed by on-orbit satellite sensors, HIPS would significantly improve estimates of on-orbit performance prior to launch, enable scientists and engineers to correct or mitigate a deficiency, and improve future designs. The envisioned device must be highly flexible to simulate a variety of scenes, both spatially and spectrally. The spectral coverage should be 0.35 – 16 μm, or at least cover selected bands such as the visible and near infrared band of 380 – 850 nm, the 6.2 μm H_2O band, the 9.6 μm O_3 band, and the 4.3 μm and 14 μm CO_2 bands. The spectral coverage can be achieved in stages. For example, the whole system can be composed of separate devices for different spectral regions. Radiometric accuracy of the system is highly desirable, although the envisioned HIPS can be complemented with existing radiometric calibration technology.

References:

Brown, S.W., J.P. Rice, J.E. Neira, R. Bousquet and B.C. Johnson. 2006. Hyperspectral Image Projector for Advanced Sensor Characterization. Proc. of SPIE, Vol. 6296, 629602.

Rice, J.P., S.W. Brown, J.E. Neira, and R.R. Bousquet. 2007. A Hyperspectral Image Projector for Hyperspectral Imagers. Proc. of SPIE, Vol. 6565, 65650C.

Rice, J.P., S.W. Brown, and J.E. Neira. 2006. Development of Hyperspectral Image Projectors. Proc. of SPIE, Vol. 6297, 629701.

Wu, X. 2008. GOES-13 Imager Channel 6 cold bias. Internal technical memorandum for NOAA/NESDIS Calibration Product Oversight Panel (CalPOP). (http://www.star.nesdis.noaa.gov/smcd/spb/fwu/solar_cal/GOES13_PLT/index.html)

8.3 TOPIC: WEATHER AND WATER

8.3.1W SUBTOPIC: In situ GPS Measurements from a Low-Cost Balloon-Borne GPS Instrument

NWS is interested in the development for an in situ (GPS) referencing system (ISRS) -- effectively a balloon-borne differential GPS reference akin to a surface-based one used with continuously operating reference stations (CORS) -- to validate GPS measurements from balloon-borne systems. An *In-Situ GPS Reference* would be very useful for independent measurements/calculations of geometric heights, geo-potential heights, derived-pressures, and the u- and v-components for calculating winds aloft. In the past, for example, validation of radiosonde GPS measurements required very costly tests at places like the White Sands Missile Range with payloads requiring special permission for lifting a very heavy apparatus aloft on a NASA-style helium balloon. With today's technological leaps, a similar low-cost package could be developed and implemented as an independent reference meeting several objectives as follows: Integration of a very accurate GPS engine with a balloon-borne telemetry system capable of measuring positional accuracies to +/- 1-meter; transmission of GPS positional data in a form acceptable for reprocessing using CORS; and developing an interface between this package and a commercial-off-the-shelf ground system to process the results to the customer. The benefits of this research include the development of a new in situ reference standard, which doesn't exist today, that can assist both government and non-government customers, e.g., radiosonde vendors, in assessing their balloon-borne GPS instrumentation and verifying performance of their measurements. Thus the federal government, with assistance from this SBIR proposal, would be establishing this new reference standard. The technological gap being filled with this research is centered on the advanced GPS technology to extend the CORS reference platform from the surface up to 35 kilometers aloft! The end goal would be a balloon-borne GPS reference package interfaced to a radiosonde/ground system with open source software, commercially available. As more applications requiring accurate GPS are flown aloft, this reference technology will play an even bigger, and possibly,

pivotal role in ensuring excellent agreement of the relative and absolute accuracies of the GPS-engines.

References:

AMS Extended Abstract, Testing Radiosonde Replacement System (RRS) Radiosondes – Part 1, Jim Fitzgibbon, and Joe Facundo, Office of Operational Systems, Silver Spring, Maryland

AMS Extended Abstract, Testing Radiosonde Replacement System (RRS) Radiosondes – Part 2, Jim Fitzgibbon, and Joe Facundo, Office of Operational Systems, Silver Spring, Maryland

AMS Extended Abstract, Use of the Consensus Reference Concept for Testing Radiosondes, Joe Facundo and Jim Fitzgibbon, Office of Operational Systems, Silver Spring, Maryland and Sterling, Virginia

ASTM Standard, D 4430, Standard practice for Determining the Operational Comparability of Meteorological Measurements.

8.3.2W SUBTOPIC: Compact, Eye-Safe, All-Weather Ground-Based Water Vapor Profiling Lidar

Water vapor profiles were first measured by Light Detection and Ranging (lidar) in 1966, shortly after the invention of the laser. Since that time, lidar technology has advanced greatly, with large advances in the various component technologies that make up a lidar, not least of which are the lasers. Progress in optical filters, digital electronic data systems, and low-noise optical detectors have all matured to the point that reliable, automated lidar systems have recently become reality. Small elastic backscatter lidar systems are offered commercially for cloud and aerosol profiling research applications, topographic mapping, and wind profiling. Water vapor lidar technology is at a point that an inexpensive, compact eye-safe system could be commercialized for operational applications. This is due mainly to the availability of reliable, inexpensive tunable lasers with wavelengths able to access the near infrared water vapor absorption bands. The widespread use of such systems operating 24/7 would go a long way to adding substantially to the data base of water vapor measurements, filling in the many gaps in coverage that existing instruments do not cover, particularly in the time domain. Routine water vapor profiles are mainly acquired using humidity sensitive capacitor instruments lofted using radiosonde balloons twice a day over the developed regions of the world. Small lidars would supplement, and then begin to replace these instruments while collecting data continuously. The lifetime of the lidars should be at least 10 years, with service intervals of 2-3 years. They should be self contained, automated, and have their data networked via hard wire or wireless interface to the Internet for convenient and real-time transfer of the data to end users. On-board data processing to level one, and in some cases to level 2 processing is feasible given the enormous leaps in digital electronics capabilities in recent years.

Preliminary measurement requirements are as follows:

1. Absolute water vapor profiles from near the surface (<100 m above ground level (AGL) desired) to the tropopause. Lower stratosphere is a desired goal.
2. Accuracy and precision: 5%
3. Vertical resolution: ~100-200 meters through the tropospheric layer.
4. Temporal resolution: 10 minutes in the boundary layer, 60 minutes above.
5. Continuous autonomous operation in all weather conditions.
6. Periodic automatic or semi-automatic calibration on site.
7. Mean Time Between Failures (MTBF): > 1yr.
8. Service/maintenance intervals: > 1 yr.
9. Service life: > 10 yr.
10. System cost: < $100K/system

Possible system architectures:
Two possible approaches may be possible: Differential Absorption lidar (DIAL) system architectures, one based on the direct transmission of a diode laser output in the 1.4-1.5 micron wavelength bands, using Pulse Code Modulation or short pulse operation. The second is a diode pumped pulsed laser operating on a water vapor absorption line near 1.44 microns and seeded by a small diode laser. Both of these architectures should be compared with other existing lidar architectures (e.g. Raman backscatter and other DIAL systems) to weigh costs and risks vs. performance as a first step toward selecting the most cost effective system for commercialization.

8.3.3R SUBTOPIC: Cross Polarization Isolation Techniques for Phased Array Weather Radars

Modern Doppler weather radars are being designed with polarimetric capability to provide hydrometeor classification and improved precipitation estimation performance. Providing sufficient polarization isolation is challenging for active phased array radars as it is difficult to develop low-cost transmit/receive modules that maintain sufficient cross polarization isolation for hydrological use. In addition, the unique ability of phased array radars to steer the beam off array broadside creates additional isolation challenges that are not encountered with today's weather radars utilizing parabolic antennas. We seek novel and innovative approaches leading to the design, development and implementation of technology that can be employed by phased array weather radars to provide sufficient cross polarization isolation and matching beams (in all directions) at the two orthogonal polarizations for the next generation Multifunction Phased Array Radar (MPAR) system.

We request a Phase I study that might lead to the development of an approach to maximize cross-polarization isolation while minimizing design costs for the next generation MPAR system. Phase I would include investigation into approaches for cross-polarization isolation to achieve the necessary end-system isolation requirement (-35dB). A cost-benefit trade study of various approaches in terms of implementation costs, impact to system, and overall performance gain would also be expected. If

successful, a Phase II activity might include the development of a prototype architecture for the isolation techniques developed in Phase I.

References:

Doviak, R.J., V. Bringi, A. Ryzhkov, A. Zahrai, and D.S. Zrnic, 2000: Considerations for polarimetric upgrades of operational WSR-88D radars. *J. Atmos. Oceanic Technol*., **17**, 257-278.

Forsyth, D. E., J. F. Kimpel, D. S. Zrnic, R. Ferek, J. F. Heimmer, T. McN`ellis, J. E. Crain, a. M. Shapiro, R. J. Vogt, W. Benner, 2007: Update on the National Weather Radar Testbed (Phased-Array). Preprints, 33rd Conference on Radar Meteorology, Cairns, Australia, American Meteorological Society, CD-ROM, 7.2.

Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) FCM-R25-2006, (June 2006) “Federal Research and Development Needs and Priorities for Phased Array Radar”, 119pp.

8.4 TOPIC: COMMERCE AND TRANSPORTATION

8.4.1N SUBTOPIC: Water Level Monitoring System for Arctic and Antarctic Coastal Oceans

Global climate change has made environmental measurements such as water level become increasingly important. Monitoring this sea level change in arctic and Antarctic regions is an important part of the matrix. Land fasted ice cover, its movement, and various other shoreline properties make shore-based sensors short lived in these regions. Continuous data records become almost impossible. Periodically getting data (e.g. pressure, water current, salinity) via an acoustic modem from a deeply mounted platform might be one method, but its vertical position and water density would have to be tracked. Measurement method could be in-situ or remote sensing.

Long-term sea level data in the Arctic and Antarctic coastal ocean will fill the gap of water level datum which is critical to the establishment of coast line survey, hydrographic survey, marine boundaries, and coastal erosion studies.

9.0 SUBMISSION FORMS
9.1 NOAA/SBIR COVER PAGE

NOAA/SBIR SMALL BUSINESS INNOVATION RESEARCH	This firm and/or Principal Investigator ___ has ___ has not submitted proposals for essentially equivalent work under other federal program solicitations, or ___ has ___ has not received other federal awards for essentially equivalent work

SOLICITATION NO.: NOAA 2009-1 | CLOSING DATE: January 14, 2009

NAME OF SUBMITTING FIRM

TAXPAYER IDENTIFICATION NUMBER

DUNS NUMBER

ADDRESS OF FIRM (INCLUDING ZIP CODE + 4)

TITLE OF PROPOSED PROJECT

REQUESTED AMOUNT: $	PROPOSED DURATION: Six (6) Months
SOLICITATION SUBTOPIC NO.	SOLICITATION SUBTOPIC TITLE

THE ABOVE ORGANIZATION CERTIFIES THAT:	YES	NO
1. It is a small business firm as defined on page 6.		
2. The primary employment of the principal investigator will be with the firm at the time of award and during the conduct of the research.		
3. A minimum of two-thirds of the research will be performed by this firm in Phase I.		
4. It qualifies as a socially and economically disadvantaged small business as defined on page 7.		
5. It qualifies as a woman-owned small business as defined on page 7.		
6. It will permit the government to disclose the title and technical abstract page, plus the name, address and telephone number of the corporate official if the proposal does not result in an award to parties that may be interested in contacting you for further information or possible investment.		
7. Is your business in a HUB Zone? (See: http://map.sba.gov/hubzone)		

PRINCIPAL INVESTIGATOR/ PROJECT DIRECTOR	CORPORATE OFFICIAL (BUSINESS)	OTHER INFORMATION
NAME (Printed)	NAME (Printed)	YEAR FIRM FOUNDED
SIGNATURE DATE	SIGNATURE DATE	NUMBER OF EMPLOYEES Average Previous 12 months _____ Currently _____
TITLE	TITLE	HAS THIS PROPOSAL BEEN SUBMITTED TO ANOTHER AGENCY? Yes ☐ No ☐
TELEPHONE NO. + AREA CODE	TELEPHONE NO. + AREA CODE	IF YES, WHAT AGENCY? _____
E-MAIL (Printed)	E-MAIL (Printed)	FAX #

PROPRIETARY NOTICE

For any purpose other than to evaluate the proposal, this data shall not be disclosed outside of the Government and shall not be duplicated, used or disclosed in whole or in part, provided that if a funding agreement is awarded to this proposer as a result of or in connection with this submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the funding agreement. This restriction does not limit the Government's right to use information contained in the data source without restriction. The data in this proposal subject to this restriction is contained on separate proprietary page(s).

9.2 NOAA/SBIR PROJECT SUMMARY FORM

NAME OF FIRM	
AMOUNT REQUESTED	
ADDRESS	PHONE # FAX # E-MAIL:
PRINCIPAL INVESTIGATOR (NAME AND TITLE)	
TITLE OF PROJECT	
SOLICITATION SUBTOPIC NUMBER	SOLICITATION SUBTOPIC TITLE
TECHNICAL ABSTRACT (LIMIT 150 WORDS)	
SUMMARY OF ANTICIPATED RESULTS	

9.3 NOAA/SBIR PROPOSAL SUMMARY BUDGET

FIRM:	PROPOSAL NUMBER: (Leave Blank)
PRINCIPAL INVESTIGATOR:	
	PRICE
DIRECT LABOR:	$
OVERHEAD RATE:	$
OTHER DIRECT COSTS:	$
MATERIALS:	$
GENERAL AND ADMINISTRATIVE (G&A):	$
PROFIT:	$
TOTAL PRICE PROPOSED:	$

THIS PROPOSAL IS SUBMITTED IN RESPONSE TO NOAA SBIR PROGRAM SOLICITATION 2009-1 AND REFLECTS OUR BEST ESTIMATES AS OF THIS DATE.

_____ _____

TYPED NAME AND TITLE DATE SIGNATURE DATE

9.4 NOAA/SBIR BUDGET INSTRUCTIONS

The offeror is to submit a cost estimate with detailed information for each element, consistent with the offeror's cost accounting system. This does not eliminate the need to fully document and justify the amounts requested in each category. Such documentation should be contained, as appropriate, on a budget explanation page immediately preceding the budget in the proposal.

1. Principal Investigator (PI)

The PI must be with the small business concern at the time of contract award and during the period of performance of the research effort. Additionally, more than half of the PI's time must be spent with the small business firm during the contract performance.

2. Direct Labor

All personnel (including PI) must be listed individually, with the projected number of hours and hourly wage.

3. Overhead Rate

Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable overhead rate (10-15% is average) may be requested, which will be subject to approval by NOAA. Overhead includes fixed costs not directly related to the research effort, e.g., rent, heat, light, facilities, telephones, maintenance, insurance, etc.

4. Other Direct Costs

List all other direct costs which are not described above (i.e. consultants, subcontractor, travel, and equipment purchases). Each of the above needs a detailed explanation and elaboration of its relation to the project. (Up to $4,000 may be allocated for technical and commercial assistance.)

5. Materials

The materials and supplies required for the project must be identified. There is also a need to specify type, quantity, unit cost, and total estimated cost of these materials and supplies.

6. General & Administration (G&A)

Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable G&A rate may be requested, subject to approval by NOAA. G&A includes costs associated with managing and running the small business, e.g. computers, copier, marketing, charitable contributions, loans, gifts, entertainment, dues, etc.

7. Profit

The small business may request a reasonable profit. About seven percent of the cost is the average proposed.

10.0 NOAA/SBIR CHECKLIST

Please review this checklist carefully to assure that your proposal meets the NOAA requirements. Failure to meet these requirements may result in your proposal being returned without consideration.

Six copies of the proposal must be received by 4:00 p.m. (CST) January 14, 2009.

_____ 1. The proposal is **25 PAGES OR LESS** in length.

_____ 2. The proposal is limited to only **ONE** of the subtopics in Section 8.

_____ 3. The proposal budget is for **$95,000 or LESS**.

_____ 4. The abstract contains **no proprietary information** and does **not exceed** space provided on the Project Summary.

_____ 5. The proposal contains only pages of 21.6cm X 27.9cm size (8 ½" X 11").

_____ 6. The proposal, Cover Page and Project Summary contains **an easy-to-read font (fixed pitch of 12 or fewer characters per inch or proportional font of point size 10 or larger) with no more than six lines per inch**, except as a legend on reduced drawings, but not tables.

_____ 7. The **COVER PAGE** has been completed and is **PAGE 1** of the proposal.

_____ 8. The **PROJECT SUMMARY** has been completed and is **PAGE 2** of the proposal.

_____ 9. The **TECHNICAL CONTENT** of the proposal begins on **PAGE 3** and includes the items identified in **SECTION 3.3.3** of the solicitation.

_____ 10. The **SBIR PROPOSAL SUMMARY BUDGET** has been completed and is the **LAST PAGE** of the proposal.

_____ 11. The P.I. is employed by the company.

NOTE: Proposers are cautioned of unforeseen delays that can cause late arrival of proposals, with the result that they may be returned without evaluation.

11.0 SBIR NATIONAL CONFERENCES

FEDERAL R&D OPPORTUNITIES
FOR
TECHNOLOGY INTENSIVE FIRMS

Sponsored by:
National Science Foundation
In Cooperation with
All Federal SBIR Departments and Agencies

Marketing Opportunities for R&D and Technology Projects with Federal Agencies and Major Corporations.

Techniques and Strategies for Commercializing R&D through Venture Capital, Joint Ventures, Partnering, Subcontracts, Licensing, and International Markets.

Management Seminars in Marketing and Business Planning.

Working with Academia and the States.

Agency and company exhibits and/or One-on-One tables will be open for networking opportunities for all attendees!

Hartford, CT November 12 – 14, 2008

For further information on this conference and upcoming conferences see the SBIR Homepage: www.sbir.gov